

Why digesters fail and what we can do about it.

I've talked with a few experts to obtain information about on-farm digester failures. This information falls into three major factors—bad design, poor materials selection, and digester management—which are discussed below. [The fourth factor is farm sale/consolidation--when a farm with a digester is sold, some people convert the land use or just don't care about the digester so they shut it down or get rid of it. Digester closures may be confused with digester failure in the case of farm sales.]

1. Bad design. Manure is flow-able and pump-able, but it is essentially a semi-solid semi-plastic material under certain temperature and pressure conditions. These properties mandate close attention to hydraulics, which are a critical part of digester design. Whether working with more fluid, low-solids materials such as swine waste, or with higher solids situations on dairy farms potential buyers need to check the track record of the technology partner with that same kind of material. Any grant for digesters should involve an engineering review to prevent failure of technology and design plan with the specific materials on the specific farm in question.

2. Poor materials selection. In general, cost-conscious farmers have tended to “buy cheap” and install used engines they have refitted for continuous operation. Sometimes this strategy meets with success, but not always. Hours lost to maintenance difficulties have discouraged farmers and given anaerobic digesters in general a bad name (see digester management below). The best choice tends to be a newer or brand new modern engine designed specifically for continuous operation. This is true for materials and other equipment as well. While it is entirely possible to cobble together a digester and make electricity, a modern anaerobic digester installation can truly integrate anaerobic digestion into the economic life of the farm or other entity. Farmers and other potential operators of anaerobic digesters need to practice more leveled life-cycle analysis rather than get something in the ground at a discount.

3. Anaerobic digester management. If farmers or other operators are screwdriver friendly, and committed, the digester is far more likely to succeed. A happy healthy digester is one whose owner monitors it, consistently feeds it and takes care of it. Depending on the technology, operations and maintenance of a farm-based digester takes approximately 15-30 minutes per day. Historically, many farmers have treated digesters as self-maintaining systems. In some failed cases, farmers did not provide manure inputs for two or three days and then overfed their digesters in an attempt to make up for lost time. Acid-forming bacteria reproduce faster than the methane-forming bugs that need that acid, so sour gas resulted. Poor gas production generates lower digester outputs, and consequently less energy flow, inferior effluent, and overall incompleteness of digestion itself. Therefore the digester “didn't work” and farmers decided not to use them any more.

Farm management must factor in that the digester is also a biological organism. Essentially, it's alive. Digesters are biological systems involving bacteria, and those bacteria have specific chemical and physical needs that must be met for a digester to process manure and produce methane while keeping the equipment in good working order. As a result, any would-be owner/operator of a digester needs to develop a routine that factors this organism into normal operations. There are protocols for most heavy farm equipment that are nearly common knowledge, but there are not enough digesters around to make their maintenance practices seem like common knowledge, yet.

In sum, the digester is somewhat like a tractor: the owner needs to tune it, oil it and protect the investment. But it is not like a tractor, because it also involves living components that must be respected. Unlike a tractor, a digester is not idle until one uses it, but instead is constantly working. In this sense a digester is more like an aquarium. After you spend quite a bit of time and money getting it properly adjusted for the organisms you want inside it, the vast majority of the time an aquarium takes care of itself...BUT you still need to provide the right light and ph, feed the fish with the right type and amount of food on a regular schedule, and clean the water when appropriate for the health of the fish. Similarly, regular feeding with consistent, properly sized and diluted feedstocks, as well as constant observation and adjustment of internal conditions and thorough maintenance of the machinery, are critical for digester success.

Recommendations: Farmers—and any other potential owners/operators of anaerobic digesters—need to know what they are getting into, conduct due diligence in working with a technology or engineering company, seek technical assistance (Michigan Biomass Energy Program, AgStar program at EPA), pay sufficiently but not exorbitantly for results, and take care of their investment like they would any other organism on their farm to ensure efficient operation and rapid payback on time and money invested.